NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Scholarship, 2004

Biology (93101)

National Statistics

Assessment Report

Assessment Schedule

Biology, Scholarship, 2004

National Statistics

Number of Results	Percentage		
	Not Achieved	Scholarship	Outstanding
644	98.3%	1.4%	0.3%

Assessment Report

Candidates who reached the scholarship standard demonstrated a wide general knowledge of the living world to which they could relate biological theory and use this to assist in answering the questions. They showed a wide biological content knowledge and used terms appropriately. These candidates were able to analyse data and use it in conjunction with biological knowledge in formulating their answers. Scholarship candidates answered in specifics rather than broad generalisations.

Evidence presented by Scholarship candidates addressed the question asked with minimal irrelevant material presented. Answers were coherent with ideas integrated and it was clear these candidates spent time planning their answers and organising their ideas. It was evident that candidates understood what was required in an answer when the questions used terms such as evaluate, discuss, compare and contrast.

Candidates who did not achieve the standard tended to write in generalisations rather than specifics eg ‘it evolved by natural selection’; ‘releasing insect resistant crops into the environment will have catastrophic effects and insects may become extinct’; ‘releasing GM crops will cause a loss of biodiversity’. They tended to use inappropriate descriptors eg ‘catastrophic’, ‘terrible’, ‘chaotic’, ‘havoc’ rather than biological terms.

In Question One, candidates who did not achieve the standard tended to treat the release of herbicide tolerant crops and insect resistant crops as one unit rather than two separate ones and so couldn’t compare and contrast them. They also tended to personify nature eg ‘ the plants want to survive’.

In Question Two, when analysing the data, candidates tended to focus on unimportant detail rather than looking for patterns and trends. They tended to describe the Figure 1 actograms rather than comparing and contrasting them ie identifying the similarities and differences.

Candidates who did not achieve the standard tended to describe rather than discuss in Question Three and while there were a lot of descriptions of the diversity in fish, there was little or no attempt made to discuss the evolutionary processes that resulted in this diversity. Candidates gave their own opinion as an evaluation.

Some candidates did not meet the standard because they did not answer all three questions, so failing to demonstrate sufficient breadth of knowledge.

The Outstanding Scholarship candidate showed evidence of accurate and extensive use of biological terminology. Communication was fluent with sophisticated use of language. They were able to demonstrate an in-depth knowledge of biology with comprehensive answers showing understanding of relationships. A high standard was evident over all three questions with no irrelevant material presented.

Assessment Schedule

Scholarship Biology (93101)

Evidence Statement

Q 1

EVIDENCE FOR SCHOLARSHIP

	Herbicide tolerant crops (HTC)	Insect resistant crops (IRC)
Ecological	• Increased use of the herbicides that plant is tolerant to (describes ecological impact eg toxic residues in soil, run-off into waterways). • There may also be a decrease in use of other herbicides (benefit to environment eg more diversity of plants). • Weed resistance may lead to increase in use of other more toxic herbicides (describes ecological impact). • HTC plants could become weeds in subsequent crops as they become more difficult to eradicate. • less competition for the crop plant as the farmer can spray herbicide at anytime over crop.	• Should reduce use of insecticides. This is beneficial to environment because: - more beneficial insects around as they are not killed by insecticides - less impact on food web as not eradicating part of the food chain. • Effect of insect resistant crops on other organisms - possible effect on non-target organisms who eat plant (student not expected to have read any research but could hypothesise) - possible impact on food web connections from a decrease in insect populations.
Evolutionary	• Increased use of herbicide can result in increase in development of weed resistance to that herbicide either through exposure or through gene flow. • Hybridisation (as a result of gene flow) with wild relatives may lead to the development of super weeds in farm or other environments ie weeds that are harder to eradicate. • Possible pleiotropic effects of the transgenes or gene interactions may alter traits such as seed dormancy, germination, tolerance to biotic or abiotic stresses leading to increasing weediness or conversely decreasing fitness. • HTC have a selective advantage in a farm or managed environment where herbicides are used (become a selection pressure). • No selective advantage for HTC in natural environments (as there are no herbicides in natural environments).	• Insects are a natural selection pressure so plants resistant to certain insects could have an evolutionary advantage (in natural environments). • The ability of insects to rapidly adapt to environmental pressures suggests the development of insects resistant to IRC is likely. • Possible pleiotropic effects of the transgenes or gene interactions may alter traits such as seed dormancy, germination, tolerance to biotic or abiotic stresses, leading to increasing weediness or conversely decreasing fitness. • Hybridisation with wild relatives (as a result of gene flow) may increase the fitness of wild plants reducing ability of natural predators to control them.
	• Use of antibiotic resistance as marker genes could result in spread of antibiotic resistance into bacterial populations through horizontal gene transfer.	

SUFFICIENCY FOR SCHOLARSHIP LEVEL (in this question)

Ecology – impact of HTC and/or IRC on chemical usage and the ecological and/or evolutionary impact of the chemical usage
– impact of IRC on food webs or non-target organisms and/or HTC on competition between GM weeds and other weeds and/or GM crop becomes a weed.

Evolution – development of pest / herbicide resistance (in weeds sprayed) and the ecological and/or evolutionary significance of this
– gene flow or pleiotropy or gene interactions or selective advantage.

POSSIBLE EVIDENCE FOR OUTSTANDING PERFORMANCE:

- recognises that release into the farm environment has different ecological and evolutionary implications from release (escape) into natural environment.
- loss of biodiversity through loss of local species / localised extinctions caused by GM crops able to out-compete local plants when growing in the natural environment (this is not the same as losing part of the food web because of IRC reducing insect numbers)
- reduction in genetic diversity –- GM crops continue modern agriculture trend of reducing genetic diversity of planted crops (NB selective breeding has been reducing genetic diversity for centuries.)
- evaluation shows depth of understanding of the biological concepts and processes involved.

2(a) EVIDENCE FOR SCHOLARSHIP

	79°	70°
Similarities eg	• feeding activity continuous / continues for 24 hours during polar day (summer months) • feeding activity more intense in summer than in winter • during times with a definite twilight period (spring and autumn), feeding activity is predominantly diurnal • during times with a definite twilight period (spring and autumn), feeding activity is crepuscular (feeds at dawn and dusk).	
Differences eg	• arrhythmic in summer and winter • had less night-time feeding activity in spring and autumn • less intense feeding in summer.	• arrhythmic during summer only • during the winter showed diurnal patterns / crepuscular activity (feeds at dawn and dusk) • had more night-time feeding activity in spring and autumn • more intense feeding in summer.

SUFFICIENCY FOR SCHOLARSHIP LEVEL (in this question)
- identifies one pattern (similarity or difference) in summer activity between the latitudes
- identifies one difference in winter activity between the latitudes
- identifies one pattern (similarity or difference) in spring/autumn activity between the latitudes.

2(b) POSSIBLE EVIDENCE FOR OUTSTANDING PERFORMANCE

Animals that show a bimodal diurnal pattern have their activity controlled by two biological clocks – one that controls the time of onset of morning activity and the other controlling the end of evening activity.

2(c) EVIDENCE FOR SCHOLARSHIP

Recognises that food searching activity is more strongly controlled by access to food than light through statements such as:
- Birds always anticipated food access irrespective of changes in light regime (supported by experimental evidence) OR
- If light was the stronger zeitgeber, then would have seen a change in activity when the timing of the light phase changed (supported by experimental evidence).

And provides evidence to support these statements.

Possible evidence
- Expt 1 – introduction of PAF (periodic access to food) resulted in transient but fairly rapid shift of evening activity until much closer to morning activity, showing that timing of food access is acting as a zeitgeber.
- Expt 2 – anticipatory activity prior to food closely followed the timing of PAF despite lights coming on 7h before food becoming available (a light-controlled clock would have been out of phase).
- Expt 3 – lack of significant transient activity following LD delay and precise nature of anticipatory feeding activity supports food-entrained clock. Also, peak of activity near end of light phase for a few days that then shifted back towards end of PAF suggests food entrained clock.

2(d)	EVIDENCE FOR SCHOLARSHIP Must account for both food and light as zeitgebers eg • Because of the continuous light / dark periods of the year, light not always able to act as a zeitgeber. • Food is essential for survival at these latitudes (build up of fat layer), so being able to anticipate seasonal food availability to synchronizing feeding to is an important survival mechanism • Feeding continuously through summer is important to build up fat reserves for winter months.	EVIDENCE FOR OUTSTANDING PERFORMANCE Answer analyses links between methods of entrainment to food and survival advantages eg • Because of weak zeitgeber of light (during winter and summer months where there is very little change in photoperiod, while in autumn, photoperiod decreases rapidly) and only periodic access to food during winter months, it is advantageous for birds to be more strongly entrained to food as a zeitgeber to anticipate its availability • Having food as the main zeitgeber also means a longer feeding period in autumn (when day length is rapidly decreasing) than if controlled by light. This enables better fat stores before winter. • In spring the birds may stock up on food to facilitate successful reproduction before competitors (other non-resident birds) arrive back.
3(a)	POSSIBLE EVIDENCE FOR SCHOLARSHIP Evolutionary theory linked to increase or decrease in diversity in named examples. Answer discusses some or all of the following concepts: variation in gene pools / sources of variation / competition / natural selection / survival of the fittest / speciation / niche availability / adaptive radiation / common ancestry.	POSSIBLE EVIDENCE FOR OUTSTANDING PERFORMANCE Shows evidence of the ability to see the interaction between environment / ecology and genetics / evolution. eg Some candidates may recognise that evolution can result in less, not more diversity, but that this is still a result of evolutionary processes. such as: – mass extinctions eg tuatara. – stabilising natural selection decreases diversity within a population in a constant environment (acts to remove extremes).

Evidence Statement

A SCHOLARSHIP answer will: use biological knowledge and skills to analyse biological situations and integrate ideas into a coherent response.	**Indicated by:** • wide biological content knowledge • appropriate use of biological terminology • concise, coherent and logical answers • ability to analyse data and relate it to biological knowledge
Sufficiency:	Answers to SCHOLARSHIP level in all three questions will demonstrate Achievement at Scholarship level

A SCHOLARSHIP WITH OUTSTANDING PERFORMANCE answer will: *demonstrate the SCHOLARSHIP criteria, and IN ADDITION will* demonstrate perception and insight in the analysis and integration.	**Indicated by:** • in-depth biological content knowledge showing understanding of relationships between different areas of biology • accurate and extensive use of biological terminology • sophisticated use of language
Sufficiency:	Answers to SCHOLARSHIP WITH OUTSTANDING PERFORMANCE level in all three questions will demonstrate Achievement at SCHOLARSHIP WITH OUTSTANDING PERFORMANCE level